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IMPACTS OF CHEMICAL FERTILIZER ON AGRICULTURAL SOIL OF DIGRAS REGION, YAVATMAL DISTRICT, MAHARASHTRA (INDIA): A CASE STUDY

Bhokare P.R.[1], *Wankhade R.R.[2]

[1] Department of Chemistry, L.R.B.Arts,Commerce & S.S.R.B.Science College, Arni Dist-Yavatmal. (MH)
[2] Department of Chemistry, B. B. Arts, B. N. Commerce & B.P. Science College Digras Dist-Yavatmal. (MH) (Corresponding Author)

ABSTRACT

The utilization of chemical fertilizers in agricultural practices has been a subject of growing concern due to its potential adverse effects on soil health and long-term sustainability. This study investigates the impacts of chemical fertilizers on agricultural soil in the Digras region of Yavatmal district, Maharashtra, India. Employing a case study approach, we assessed various parameters including soil pH, EC, OC, Nitrogen, Potassium, Phosphorous, Sulphur, Zink, Boron, Iron, Manganese and Copper content. The study area was divided into five sampling stations to cover the most farms of Digras tehsil comprehensively in the November 2023.

KEYWORDS: Physico-Chemical Parameters, Fertilizers, Digras Region, Soil Quality.

INTRODUCTION

Soil is a complex and dynamic mixture of mineral particles, organic matter, water, air, and living organisms that forms the outermost layer of the Earth's crust. It is a crucial component of terrestrial ecosystems, playing essential roles in supporting plant growth, regulating water and nutrient cycles, and sustaining biodiversity.[17] Health and growth of plant is determined through soil fertility and soil fertility is determined by the availability of macro and micronutrients.[4] Fertility of the soil is one of the most significant aspects regulating crop yield.[7] Plant usually need the primary nutrients Nitrogen(N), Phosphorus(P) and Potash(K) for healthy growth and development. If any of these nutrients are deficient during the life cycle, Plant growth and development are adversely affected. An ideal supply of fertilizers can enhance the crop yields.[9]

Modern agricultural practices such as application of chemical synthetic fertilizers, pesticides, herbicides and soil conditioning reagents are responsible for soil pollution. This practice converts the fertile soil into non-fertile soils. According to the researches and studies the effects of chemical fertilizers on the soil is not immediately obvious. Chemical fertilizers play a vital role in enhancing crop yields. However, their imbalanced use can lead to adverse effects on soil quality, crop production, and overall ecosystem health.[2,6] Organic fertilizers are fertilizers that are naturally produced and contain carbon (C). Fertilizers are nutrient supporter materials that can be added to soil or plants, in order to provide nutrients and sustain growth[3] Most of the farmers do not use soil testing procedures to check the requirement of various NPK fertilizers and other micro nutrients before application of fertilizers. Maintaining and enhancing soil fertility through organic farming is crucial for the development of sustainable crops.[5] and fallow the new technics which encourage the young farmers to apply manure where and when it is most needed to preserve soil fertility over the long term.[8]

Study Area

Digras is situated in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha region Yavatmal Division, This area is well known for cotton and

Soyabean, Tur. The sources of water for this area is of well and tube well.

Sample Collection

Samples were collected from the study area (farmers field) in the month of November 2023. Soil samples were collected randomly at 0 to 15 cm and 15 to 30 cm depths with ten plots, ten samples from each plot respectively. Soil sample were collected with the help of khupri spade and meter scale in well sterilized polythene pouches.

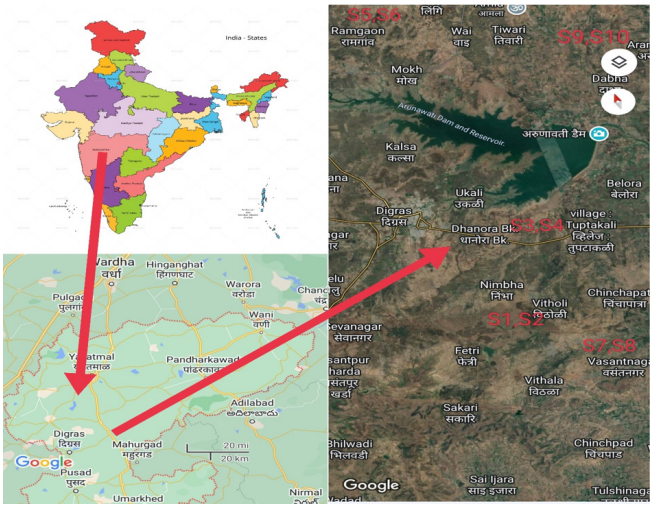


Figure 1. Map of Study area Digras region

RESULT AND DISCUSSION

pH.

Soil pH is one of the important chemical property which control many soil propertis. The range of pH is found in between 7.05 – 8.21. The sample S1,S2 and S3 is slightly alkaline sample as compare to other soil sample.

Electric Conductance

Electrical conductivity (EC) of soil measures the ability of soil water to carry electrical current and which is influencing the electrical conductivity of soils include the amount and type of soluble salts in solution, soil texture (especially clay content and mineralogy), porosity, soil temperature, and soil moisture. The Electric Conductance values varies from 0.17 – 0.49 ms. It is seen that soil sample S1,S5,S8 have less amount of Electric Conductance as compared to other soil sample.

Organic Carbon

Organic carbon were recorded in the range of 0.15 – 0.66%. The soil sample S8 has high, S2,S4,S6,S10 have moderate percentage of organic carbon as compared to other soil sample.

Nitrogen

Nitrogen content in the soil ranged from 112.90- 351.23 kg/ hect. All the sample have low to medium nitrogen nutrient. The sample S1 and S9 found that very low nitrogen content as compared to other sample.

Phosphorous

Phosphorous content in the soil sample ranged between 11.02-25.90 kg/hector. All the sample have low to moderately high Phosphorous nutrient. The soil sample S2,S4 and S10 found that very low Phosphorous content as compared to other sample.

more phosphorous content as compared to sample S1,S2 and S4.

Potassium

Potassium content in the soil sample ranged between 247.52 – 534.24 kg/hector. All the sample have moderately to very high source of potassium nutrient The soil sample S1,S2 and S6 are very rich source of potassium nutrient as compared to sample.

Sulphur

Sulphur content in the soil sample ranged between 10.53 – 20.19 mg/kg. The soil sample S7 and S8 have low Sulphur content as compare to other soil sample.

Zink

Zink content in the soil sample ranged between 0.13 – 0.80 ppm. All the sample have low to medium Zink content.

Boron

Boron content in the soil sample ranged between 0.20 – 1.01 ppm.

Iron

Iron content in the soil sample ranged between 1.2 – 6.76 ppm. . The soil sample S3,S4,S4 and S5 have very low Iron content.

Manganese

Manganese content in the soil sample ranged between 2.48 – 12.6 ppm. . The soil sample S2 and S6 have high Manganese content as compare to other soil sample.

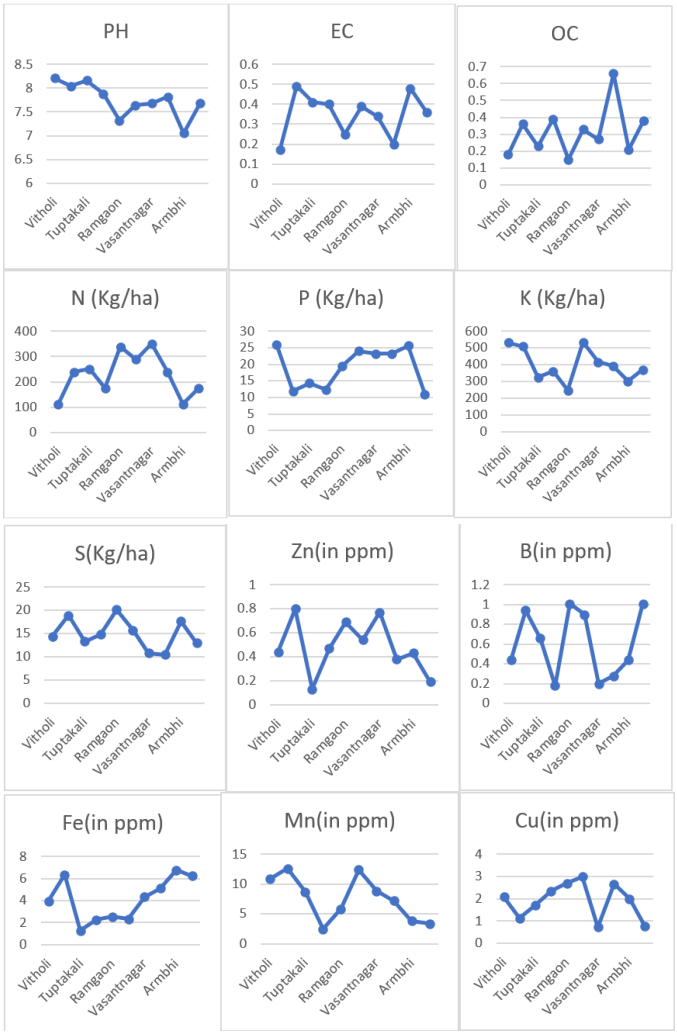
Copper

Copper content in the soil sample ranged between 2.48 – 12.6 ppm. . The soil sample S10 have low Copper content as compare to other soil sample.

CONCLUSION

fertilizers contribute to increased crop yields in the short term, their long-term effects can be detrimental to soil health and the environment. Over-reliance on chemical fertilizers can lead to soil degradation, nutrient imbalances, loss of biodiversity, and water pollution. Sustainable agricultural practices that prioritize soil conservation, organic fertilizers, crop rotation, and integrated pest management offer promising alternatives to mitigate these negative impacts and ensure the long-term viability of agricultural systems. By adopting these practices, we can strike a balance between maximizing productivity and preserving the health and fertility of our soils for future generations

Sample	Village	PH	EC	OC	N	P	K	S	Zn	B	Fe	Mn	Cu
S1	Vitholi	8.21	0.17	0.18	112.90	25.90	530.88	14.46	0.44	0.44	3.95	10.85	2.08
S2	Vitholi	8.04	0.49	0.36	238.34	11.85	508.48	18.96	0.80	0.94	6.36	12.60	1.12
S3	Tuptakali	8.16	0.41	0.23	250.88	14.33	323.68	13.30	0.13	0.66	1.29	8.71	1.71
S4	Tuptakali	7.88	0.40	0.39	175.62	12.40	360.64	14.84	0.47	0.18	2.27	2.48	2.34
S5	Ramgaon	7.32	0.25	0.15	338.69	19.56	247.52	20.19	0.69	1.01	2.56	5.82	2.69
S6	Ramgaon	7.64	0.39	0.33	288.51	23.97	534.24	15.78	0.54	0.90	2.32	12.42	2.99
S7	Vasantnagar	7.68	0.34	0.27	351.23	23.14	415.52	10.84	0.77	0.20	4.33	8.85	0.73
S8	Vasantnagar	7.82	0.20	0.66	238.34	23.14	392.00	10.53	0.38	0.28	5.11	7.21	2.66
S9	Armbhi	7.05	0.48	0.21	112.90	25.62	301.28	17.71	0.43	0.44	6.76	3.81	2.00
S10	Armbhi	7.69	0.36	0.38	175.62	11.02	370.72	13.01	0.19	1.01	6.26	3.33	0.76



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